Claims

1. (currently amended) A combination for installing anti-slip studs, said combination comprising:

an air-filled vehicle tire, provided with a tread with a rolling surface;

anti-slip studs provided with an outer head and an inner head, and in the inner head a bottom flange and in the outer head a top bowl, the bottom flange ~~in the tread~~ being deeper from the rolling surface and the top bowl being nearer to the rolling surface when the stud is installed in said tread; said anti-slip studs having a stud length and a stud center line parallel to said stud length, and the bottom flange having a cross-sectional shape perpendicular to the stud center line, which cross-sectional shape is comprised of: a number of at least two first side portions with center regions at a shorter distance from said stud center line, and a number of at least two second side portions with center regions at a longer distance from said stud center line; and

an installation tool by which said anti-slip studs are installed in said tread,

said combination further comprising:

a plurality of premade stud recesses in said tread;

a number of jaw fingers in said installation tool, which number is equal to twice the number of said second side portions; and

said jaw fingers capable of being in contact with at least two such first side portions of the bottom flange of the anti-slip stud where said center regions are located at a shortest distance from said stud center line, in order to keep the bottom flange and hence the anti-slip stud in a predetermined constant position between said jaw fingers, wherein the anti-slip stud is maintained in the predetermined constant position without the need for a stud injection tube.

2. (original) A combination according to claim 1, wherein the number of said second side portions is two, and the number of said jaw fingers is four.

3. (original) A combination according to claim 1, wherein said second side portions are gradually or steplessly changing into said first side portions.

4. (original) A combination according to claim 3, wherein said second side portions and said first side portions together form an oval.

5. (original) A combination according to claim 1, further comprising a separate hard cermet piece in said anti-slip stud, which hard cermet piece extends from said outer head to at least the length of the top bowl, and has a non-round cross-sectional shape in a plane perpendicular to the stud center line.

6. (original) A combination according to claim 5, wherein said non-round cross-sectional shape of the hard cermet piece is: substantially elongate, having a largest width and being located in the anti-slip stud either so that said largest width is perpendicular to the longer distance of the bottom flange, or so that said largest width is turned by a toe-out angle.

7. (original) A combination according to claim 1, wherein said stud recesses have a bottom expansion for the bottom flange of the anti-slip studs, said bottom expansion having a shape that is substantially similar to that of the bottom flange.

8. (previously presented) A combination according to claim 1, wherein said stud recesses each have an at least partly circular inner surface having a hole diameter.

9. (original) A combination according to claim 1, wherein said jaw fingers of the installation tool have a jaw length that is substantially longer than the stud length of the anti-slip studs, and a mutual jaw center line that substantially concurs with the center line of the anti-slip studs to be installed.

10. (original) A combination according to claim 9, wherein said jaw fingers are radially movable towards said jaw center line and away therefrom.

11. (previously presented) A combination according to claim 8, wherein when the jaw fingers are in a position shifted towards said jaw center line and in mutual contact, said jaw

fingers have tip portions that jointly form a transversal tip dimension that is larger than said hole diameter, but not more than a first tolerance.

12. (original) A combination according to claim 11, wherein said jaw fingers have cross-sections that are radially getting larger from said tip portions in the direction of the jaw lengths with respect to the jaw center line.

13. (previously presented) A combination according to claim 9, wherein said installation tool further comprises a plunger pin movable in the direction of said jaw center line and to enter a mutual interval of the jaw fingers, while the jaw fingers are radially moved away from each other.

14. (original) A combination according to claim 1, wherein said longer distance of the anti-slip stud bottom flange extends to outside an envelope curve drawn around the jaw fingers, but not more than a second tolerance, in a situation where the anti-slip stud is in a mutual interval of the jaw fingers.

15. (original) A combination according to claim 1, wherein said bottom flange has beveled edges.

16. (currently amended) A combination for installing anti-slip studs, said combination comprising:

an air-filled vehicle tire, provided with a tread with a rolling surface, and a plurality of premade stud recesses in the tread;

anti-slip studs, provided with an outer head and an inner head, and in the inner head a bottom flange and in the outer head a top bowl, the bottom flange in the tread being deeper from the rolling surface and the top bowl being nearer to the rolling surface; said anti-slip studs having a stud length and a stud center line parallel to said stud length, and the bottom flange having a cross-sectional shape perpendicular to the stud center line, which cross-sectional shape is comprised of: a number of at least two first side portions with center regions at a shorter distance from said stud center line, and ~~of~~ a number of at least two edge portions; and

an installation tool by which said anti-slip studs are installed in said tread,

said combination further comprising:

a number of jaw fingers in said installation tool, which number is equal to the number of said edge portions; and

said jaw fingers being in contact with at least two such first side portions of the bottom flange of the anti-slip stud where said center regions are located at a shortest distance from said stud center line, in order to keep the bottom flange and hence the anti-slip stud in a predetermined constant position between said jaw fingers, wherein the anti-slip stud is maintained in the predetermined constant position without the need for a stud injection tube.

17. (original) A combination according to claim 16, wherein the number of said edge portions is at least three but no more than six.

18. (previously presented) A combination according to claim 16, wherein the number of said edge portions is:

three and the number of said jaw fingers is three; or

four and the number of said jaw fingers is four; or

five and the number of said jaw fingers is five; or

six and the number of said jaw fingers are six.

19. (original) A combination according to claim 16, wherein said edge portions have a radius of curvature.

20. (original) A combination according to claim 16, wherein said first side portions are convex or straight or concave.

21. (previously presented) A combination according to claim 16, further comprising a separate hard cermet piece in said anti-slip stud, wherein the hard cermet piece extends from said outer head to at least the length of the top bowl and has a non-round cross-sectional shape in a plane perpendicular to the stud center line.

22. (previously presented) A combination according to claim 21, wherein said non-round cross-sectional shape of the hard cermet piece is selected from the group consisting of substantially triangular, quadrangular, pentagonal and hexagonal, wherein the non-round cross-sectional shape comprises major dimension, and wherein the hard cermet piece is located in the anti-slip stud such that the major dimension of the cermet piece is either (i) substantially parallel to a major dimension of the bottom flange, the bottom flange having a non-round cross-sectional shape selected from the group consisting of substantially triangular, quadrangular, pentagonal and hexagonal; or (ii) at a toe-out angle with respect to the major dimension of the bottom flange.

23. (original) A combination according to claim 21, wherein the hard cermet piece is triangular in shape and comprises three concave sides and three planar or outwardly convex edges.

24. (original) A combination according to claim 23, wherein said concave sides have side spans, and said edges have angular spans between transition points of edge planes or edge roundings and concavities of said concave sides, whereupon the ratio of the side spans to the angular spans is not more than 4:1 but at least 0.8:1.

25. (original) A combination according to claim 24, wherein the ratio of said side spans to said angular spans is not more than 3:1 but at least 1.2:1.

26. (previously presented) A combination according to claim 23, wherein said concave sides of the hard cermet piece have radii of curvature that are at least half of but not more than three times the radius of a circle drawn around and tangential to the outermost edges of said hard cermet piece.

27. (previously presented) A combination according to claim 24, wherein said convex edges have a radius of curvature that is at least half of said angular span, but not more than twice the radius of a circle drawn around and tangential to the outermost edges of said hard cermet piece.

28. (previously presented) A combination according to claim 23, wherein said triangular hard cermet piece has three major radii, and said bottom flange is triangular having three major radii, whereupon said hard cermet major radii are either parallel with the flange major radii or parallel with central intervals of the flange major radii.

29. (original) A combination according to claim 16, wherein said stud recesses have a bottom expansion for the bottom flange of the anti-slip studs, said bottom expansion having a shape that is substantially similar to that of the bottom flange.

30. (original) A combination according to claim 16, wherein said stud recesses have an at least partly circular inner surface with hole diameters.

31. (original) A combination according to claim 16, wherein said jaw fingers of the installation tool have a jaw length that is substantially longer than the stud length of the anti-slip studs, and a mutual jaw center line that substantially concurs with the center line of the anti-slip studs to be installed.

32. (original) A combination according to claim 31, wherein said jaw fingers are radially movable towards said jaw center line and away therefrom.

33. (previously presented) A combination according to claim 30, wherein when the jaw fingers are in a position shifted towards said jaw center line and in mutual contact, said jaw fingers have tip portions that jointly form a transversal tip dimension that is larger than said hole diameter, but not more than a first tolerance.

34. (original) A combination according to claim 33, wherein said jaw fingers have cross-sections that are radially getting larger from said tip portions in the direction of the jaw lengths with respect to the jaw center line.

35. (previously presented) A combination according to claim 31, wherein said installation tool further comprising a plunger pin movable in the direction of said jaw center line and to enter a mutual interval of the jaw fingers, while the jaw fingers are radially moved away from each other.

36. (original) A combination according to claim 16, wherein said longer distance of the anti-slip stud bottom flange extends to outside an envelope curve drawn around the jaw fingers, but not more than a second tolerance, in a situation where the anti-slip stud is in a mutual interval of the jaw fingers.

37. (original) A combination according to claim 16, wherein said bottom flange has beveled edges.

38. (currently amended) A method for installing non-round anti-slip studs in a vehicle tire tread, said method comprising the steps of:

providing an air-filled vehicle tire with a tread and a plurality of premade stud recesses in the tread, said tire having a rotation axis line;

utilizing an installation tool comprising:

a number of at least three jaw fingers provided with narrowing tip portions, said jaw fingers being radially movable along their mutual jaw center line and radially away therefrom, and

a plunger pin that is movable in parallel with the jaw center line and in the mutual interval between the jaw fingers;

inserting said tip portions of the installation tool in said stud recesses, one recess at a time;

entering an anti-slip stud provided with a top bowl and a bottom flange in the mutual interval, so that the bottom flange proceeds foremost;

pressing said anti-slip stud by ~~a~~ said plunger pin into the stud recess, along said mutual interval, so that the jaw fingers expand the stud recess;

allowing said plunger pin to hold the anti-slip stud in the recess at the same time as the jaw fingers are pulled out of the stud recess, from around the anti-slip stud; and

proceeding to install the next anti-slip stud in the next stud recess, or terminating the installation of the studs in this tire,

said method further comprising the steps of:

using anti-slip studs of a type having an oval or polygonal bottom flange that is at least partly wider than said top bowl, and with a non-round hard cermet piece arranged on a cross-sectional plane perpendicular to the stud center line, said shape of the hard cermet piece being in a constant position with respect to the shape of the bottom flange; and

turning at least the jaw fingers of the installation tool around the jaw center line by a predetermined toe-out angle or without said toe-out angle in respect to said rotation axis line of the tire,

in order to orientate the hard cermet piece of the studs in a predetermined position in the tire with respect to said rotation axis line, wherein the hard cermet piece of the studs is oriented into and maintained in the predetermined position without the need for a stud injection tube.

39. (currently amended) A method for installing non-round anti-slip studs in a vehicle tire tread, said method comprising the steps of:

providing an air-filled vehicle tire with a tread and a plurality of premade stud recesses in the tread, said tire having a rotation axis line;

utilizing an installation tool comprising:

a number of at least three jaw fingers provided with narrowing tip portions, said jaw fingers being radially movable along their mutual jaw center line and radially away therefrom, and

a plunger pin that is movable in parallel with the jaw center line and in the mutual interval between the jaw fingers;

inserting said tip portions of the installation tool in said stud recesses, one recess at a time;

entering an anti-slip stud provided with a top bowl and a bottom flange in the mutual interval, so that the bottom flange proceeds foremost;

pressing said anti-slip stud by ~~a~~ said plunger pin into the stud recess, along said mutual interval, so that the jaw fingers expand the stud recess;

allowing said plunger pin to hold the anti-slip stud in the recess at the same time as the jaw fingers are pulled out of the stud recess, from around the anti-slip stud; and

proceeding to install the next anti-slip stud in the next stud recess, or terminating the installation of the studs in this tire,

said method further comprising the steps of:

using anti-slip studs of a type having an oval or polygonal bottom flange that is at least partly wider than said top bowl, and a hard cermet piece that is non-round on the cross-sectional plane perpendicular to the stud center line;

maintaining at least the position of the jaw fingers of the installation tool in a constant position in respect to said rotation axis line of the tire; and

changing the type of the anti-slip studs to be installed, so that studs where the shape of the hard cermet piece is rotated by a predetermined toe-out angle with respect to the shape of the bottom flange are replaced by studs where said toe-out angle does not exist, or vice versa,

in order to orientate the hard cermet piece of the studs in a predetermined position in the tire with respect to said rotation axis line, wherein the hard cermet piece of the studs is oriented into and maintained in the predetermined position without the need for a stud injection tube.

40. (previously presented) A combination according to claim 9, wherein when the jaw fingers are in a position shifted towards said jaw center line and in mutual contact, said jaw fingers have tip portions that jointly form a transversal tip dimension that is larger than said hole diameter, but not more than a first tolerance.

41. (previously presented) A combination according to claim 31, wherein when the jaw fingers are in a position shifted towards said jaw center line and in mutual contact, said jaw fingers have tip portions that jointly form a transversal tip dimension that is larger than said hole diameter, but not more than a first tolerance.